

# MIOCENE BIRDS FROM THE HAWTHORNE FORMATION

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ONLY a single bird, *Palaeochenoides mioceanus* Shufeldt (1916) from the Hawthorne Formation in South Carolina, is presently known from marine beds of early Miocene age in eastern North America. In the present paper four additional species are described from the Hawthorne beds in Gainesville and Tallahassee, Florida. They are of interest not only as adding to our knowledge of the early Miocene avifauna but especially as they afford evidence that the Hawthorne Formation belongs in the Lower Miocene and permit its correlation with the rich land vertebrate fauna of the Thomas Farm in northern Florida, with the Arikareean provincial age in the interior of western North America, and with the Aquitanian stage in Europe.

In naming these beds Dall (1892) used the spelling Hawthorne, after the town in Alachua County, Florida. Following usage by the Post Office Department, the spelling was emended to Hawthorn (Cooke and Mossom, 1929; Wilmarth, 1957). Nevertheless, in a letter dated August 23, 1956, Hon. Sidney Martin informs me that the original settlement was known as Graball, later as Waets Crossing, and then changed to Hawthorne after its founder, Sam Hawthorne. The city has always used the spelling with the final *e*. At the request of Mayor Martin in 1948, Representative Harry E. Bennett obtained passage through Congress of a bill requiring the post office to adopt the spelling Hawthorne. In view of these considerations it is apparent that the formational name should likewise revert to the original and official spelling in use by the city, the post office, and the state road department.

Much of the field work during this study was under cooperative agreement with the Florida Geological Survey. The National Science Foundation aided laboratory work, through grant number G-19595. Stanley J. Olsen and Druid Wilson identified specimens of mammals and mollusks, respectively. The photographs are by Robert W. McFarlane.

Family PROCELLARIIDAE Boie. Shearwaters

*Puffinus micraulax*, new species

Plate 1, figs. *a-b*

*Holotype*. Distal portion of left humerus, University of Florida no. 4872. From Hawthorne Formation along Hogtown Creek, at

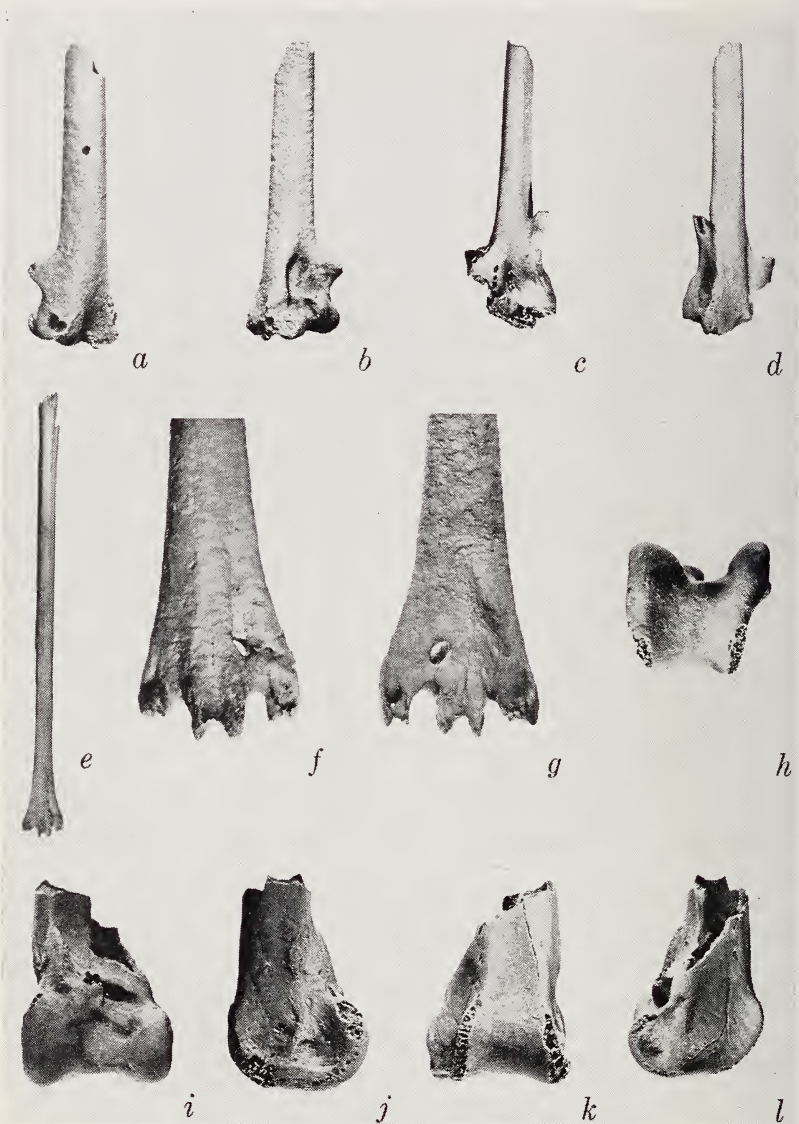


Plate 1. Holotype of birds from the Hawthorne Formation. Figs. a-b: *Puffinus micraulax*, n. sp.; length as preserved, 26.8 mm. Figs. c-d: *Sula universitatis*, n. sp.; length as preserved, 42 mm. Figs. e-g: *Propelargus olseni*, n. sp.; length as preserved, 232; distal width, 21.7 mm. Figs. h-l: *Probalearica crataegensis*, n. sp.; length as preserved, 21.4; distal width, 15.3 mm.

northeast corner of NW 16th Street and NW 39th Avenue, Gainesville, Alachua County, Florida, in SE  $\frac{1}{4}$  of SE  $\frac{1}{4}$ , section 19, Township 9 South, Range 20 East. Collected by Kent Ainslie, January-June 1961.

*Diagnosis.* A very small species of *Puffinus* Brisson, slightly smaller than living *Puffinus lherminieri* Lesson, from which it differs further in having brachial depression much less deep; distal edge of ectepicondylar process more concave; common pit of origin of extensor digitorum communis and supinator brevis and common pit of origin of flexor metacarpi radialis and anconeus much smaller.

Length as preserved, 26.8; greatest distal width, 8.3; width through condyles, 5.4; length through ectepicondylar process, 7.0; width of shaft, 3.6 mm.

In Europe Tertiary species of *Puffinus* occur from the Middle Oligocene to the Middle Miocene, with *P. raemdonckii* (Van Beneden), *P. arvernensis* Milne-Edwards, *P. aquitanicus* (Milne-Edwards), and *P. antiquus* (Milne-Edwards). In California six species occur from the Middle Miocene to the Lower Pliocene, with *P. inceptor* Wetmore, *P. priscus* L. Miller, *P. mitchelli* L. Miller, *P. diatomicus* L. Miller, *P. felthami* Howard, and *P. kanakoffi* Howard. The only species of shearwater previously described from the Tertiary of eastern North America is *P. conradi* Marsh from the Middle Miocene of Maryland. All of these are much larger than *P. micraulax*.

*Etymology.* The specific name is from Greek *micraulax*, with small furrows.

Family SULIDAE (Reichenbach). Boobies

*Sula universitatis*, new species

Plate 1, figs. c-d

*Holotype.* Proximal portion of left carpometacarpus, with proximal portion of trochleae and process of metacarpal I missing, Brodkorb no. 8505 at University of Florida. From Hawthorne Formation along unnamed creek flowing south from Fraternity Row toward Lake Alice, University of Florida campus, Gainesville, Alachua County, Florida, in NW  $\frac{1}{4}$ , section 3, Township 10 South, Range 19 East. Collected by Robert Strawn, May 1958.

*Diagnosis.* Agrees with *Sula* Brisson and differs from *Morus* Vieillot in having pollical facet compressed, with lower end of

outer portion strongly elevated (facet wide in *Morus*, with lower edge of outer portion only slightly elevated); a longitudinal groove with raised borders below and distal to scar of flexor metacarpi radialis (groove obsolete in *Morus*); fossa for ulnare deep and compressed (wide and shallow in *Morus*).

Similar in size to living *Sula leucogaster* (Boddaert), from which it differs in having a large pneumatic foramen on external side of base of metacarpal I; external trochlea with lower edge notched only slightly by ligamental groove to ulnare; scar of flexor metacarpi radialis not laterally produced; fossa for ulnare without pneumatic foramina; internal trochlea with distal portion of internal face nearly flat (strongly concave in *S. leucogaster*); a row of 4 large pneumatic foramina above pisiform process.

Length as preserved, 42; least width of metacarpal II, 5.5; least height of metacarpal II, 3.2; width of pollical facet, 4.0 mm.

Extinct fossil species of typical *Sula* occur in France from the Lower Oligocene to the Middle Miocene, with *S. ronzonei* (Gervais), *S. arvernensis* Milne-Edwards, and *S. pygmaea* Milne-Edwards. Tertiary species occur in California from the Middle Miocene to the Middle Pliocene, with *S. willetti* L. Miller, *S. pohli* Howard, and *S. humeralis* L. Miller and Bowman. In the Lower Pliocene of Florida *S. guano* Brodkorb and *S. phosphata* Brodkorb are known.

*Sula universitatis* is smaller than *S. ronzonei*, *S. arvernensis*, *S. pohli*, and *S. humeralis*, and than described species of the genera *Miosula* L. Miller and *Palaeosula* Howard. It is larger than *S. pygmaea* and *S. willetti*, as well as *Microsula avita* (Wetmore) from the Middle Miocene of Maryland. Comparison with *S. guano* and *S. phosphata* is not yet possible, but the age differential of *S. universitatis* is too great for specific identity.

*Etymology.* This species is named for the University of Florida.

Family CICONIIDAE (Gray). Storks

*Propelargus olseni*, new species

Plate 1, figs. e-g

*Holotype.* Left tarsometatarsus, lacking proximal end and tips of trochleae, Brodkorb no. 8504 at University of Florida. From Hawthorne Formation in white bed above oyster bar, north of "Runaway Track," Switchyard B, Seaboard Airline Railroad Company, in Tallahassee, Leon County, Florida, in SE  $\frac{1}{4}$  of NW  $\frac{1}{4}$ ,

section 3, Township 1 South, Range 1 West. Collected by Stanley J. Olsen and party, August 25, 1961.

*Diagnosis.* Referable to *Propelargus* Lydekker on basis of expanded distal end of tarsometatarsus, low position of distal foramen, and flatness of curve formed by trochleae. Differs from *P. cayluxensis* Lydekker of the Upper Eocene or Lower Oligocene of France in its wider intertrochlear spaces and smaller size. In *P. edwardsi* Lydekker, from the Aquitanian of France, the distal portion of the tarsometatarsus is unknown, but that species is a much larger bird, matching the size of living *Jabiru mycteria* (Lichtenstein) and *Leptoptilos javanicus* (Horsfield), whereas *P. olseni* scarcely exceeds living *Ibis leucocephalus* (Pennant).

Length as preserved, 232; length from upper end of tubercles for tibialis anticus to intertrochlear notch, 222; distal width, 21.7; least width of shaft, 9.0; width of shaft in middle, 9.2; depth of shaft in middle, 8.3 mm.

*Etymology.* This species, the first stork described from the Tertiary of North America, is named for Stanley J. Olsen, vertebrate paleontologist of the Florida Geological Survey.

Family GRUIDAE Vigors. Cranes

*Probalearica crataegensis*, new species

Plate 1, figs. h-l

*Holotype.* Distal end of right tibiotarsus, Brodkorb no. 8503 at University of Florida. From Hawthorne Formation in white bed just above oyster bar, north of "Runaway Track," Switchyard B, Seaboard Airline Railroad Company, in Tallahassee, Leon County, Florida, in SE  $\frac{1}{4}$  of NW  $\frac{1}{4}$ , section 3, Township 1 South, Range 1 West. Collected by Stanley J. Olsen and party, August 25, 1961.

*Diagnosis.* Referred to *Probalearica* Lambrecht on basis of similarity to living *Balearica* Brisson (tibiotarsus unknown in type species of *Probalearica*). Distal border of intertrochlear area transverse in posterior view, only slightly inclined in distal view; external condyle with distal border rounded and notch obsolete; external ligamental prominence moderately developed (strong in *Grus*, weak in *Anthropoides*); internal ligamental prominence little produced internally and best seen in distal view; lower, external attachment for supratendinal ligament short and blunt.

Differs from living *Balearica pavonina* (Linnaeus) in having internal condyle without pronounced inward swing anteriorly, in distal view; internal ligamental prominence nearly vertical; size much less.

Length as preserved, 21.4; distal width, 15.3; antero-posterior depth of external condyle, 13.9; antero-posterior depth of internal condyle, 14.4 mm.

The internal ligamental prominence is mislabeled "Tuberculum zum Inserierung des M. peroneus profundus" in figure 155 and in the discussion on page 518 of Lambrecht (1933). The peroneal muscles run along the external instead of the internal side of the bone and insert distad to the tibiotarsus.

The only previously known Miocene cranes are *Probalearica problematica* (Milne-Edwards) and *Palaeogrus excelsa* (Milne-Edwards), both from the Aquitanian of France and both much larger species.

*Etymology.* The specific name is from Greek *krataigos*, Latin *crataegos*, a hawthorn bush.

#### CORRELATION WITH OTHER FAUNAS

Five genera of birds are now known from the Hawthorne Formation. *Sula* and *Puffinus* are here without stratigraphic significance, since these genera range from the Lower or Middle Oligocene, respectively, to the Recent. *Palaeochenoides* belongs to a family otherwise known only from the Carmanah Point beds of Vancouver Island, which underlie the Monterey Formation (Wilmarth, 1957) and hence are of early Miocene age or older. *Propelargus* and *Probalearica* are unknown after the Aquitanian (earliest Miocene) of Europe. An early Miocene age for the Hawthorne is thus strongly indicated.

At Tallahassee the type locality of the two birds contains the remains of mammals and mollusks. Olsen (1963) identifies the mammals as a camel and two horses, *Oxydactylus floridanus* Simpson, *Parahippus leonensis* Sellards, and *P. blackbergi* (Hay); all of these occur in the early Miocene Thomas Farm local fauna. Druid Wilson (letter of October 23, 1961) states that the pelecypod fauna is comparable to other known Hawthorne assemblages of early Miocene age and includes the following species: *Ostrea rugifera*

Dall, *Ostrea* cf. *pauciplicata* Dall, *Crassostrea* sp., *Pododesmus scopelus* Dall, and *Chione* cf. *chipolana* Dall.

At Gainesville lenses of oysters occur in several Hawthorne localities, including Colclough Hill, where Pirkle (1957) reported a typical Hawthorne oyster, *Ostrea normalis* Dall. At Colclough Hill I obtained in association with marine fossils a few land vertebrates, including a horse identified by Olsen (1959) as *Parahippus blackbergi*, a species that is common at the Thomas Farm and whose type locality is in the late early Miocene of Texas (Quinn, 1955). Both Colclough Hill and the type locality of *Sula universitatis* lie in stratigraphically similar positions on the southern edge of the Hawthorne escarpment at Gainesville.

The presence of identical species of mammals at Tallahassee, Gainesville, and the Thomas Farm indicates contemporaneity of the sites. The rich Thomas Farm local fauna is coetaneous with the Arikareean provincial age of the interior of western North America (Olsen, 1962, and numerous other sources). The Arikareean in turn correlates with the Aquitanian and the early part of the Burdigalian in the European chronology (Thenius, 1959). All evidence thus confirms an early Miocene age for the Hawthorne.

The Miocene history of Florida includes three invasions of the sea, the Tampa, Alum Bluff, and Choctawhatchee stages (Cooke, 1945; Puri and Vernon, 1959). In the early Miocene a warm sea deposited the Tampa limestone over the southern and western parts of the state. During Alum Bluff time the warm sea transgressed perhaps all Florida and extended north to the southern tip of South Carolina, across southern Georgia and Alabama, and westward to Texas. Lithological units formed during Alum Bluff time include the Chipola marl in the panhandle region of western Florida and the Hawthorne beds in the peninsula. The sea then withdrew, presumably beyond the present shore line. During Choctawhatchee time, in the late Miocene, the sea again covered parts of Florida, but its marine fauna reflects cooler conditions.

There is general agreement that the Tampa limestone is of early Miocene age, and the Choctawhatchee represents the late Miocene, but opinion is divided as to the occurrence of an unconformity between the Tampa and Alum Bluff stages. The Alum Bluff was formerly considered early Miocene, but Cooke (1945) transferred it to the Middle Miocene. Such assignment is followed by the Florida Geological Survey (Puri and Vernon, 1959) but is

not accepted by the U. S. Geological Survey, which still places these beds in the Lower Miocene (Wilmarth, 1957).

On the basis of the invertebrate fauna Woodring (1960) correlates the Lower Miocene of the Caribbean area with the Aquitanian of Europe and further subdivides this portion of the epoch into early and late divisions. In view of the above considerations it would appear that the Hawthorne-Alum Bluff stage belongs in the late portion of the Lower Miocene. The Hawthorne Formation may merely represent a higher stand of the same warm, transgressing sea that deposited the Tampa limestone during its opening phase.

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